US Department of Energy

U.S. Clean Technology Development

Presented by Hon. Alexander "Andy" Karsner
United States Assistant Secretary of Energy

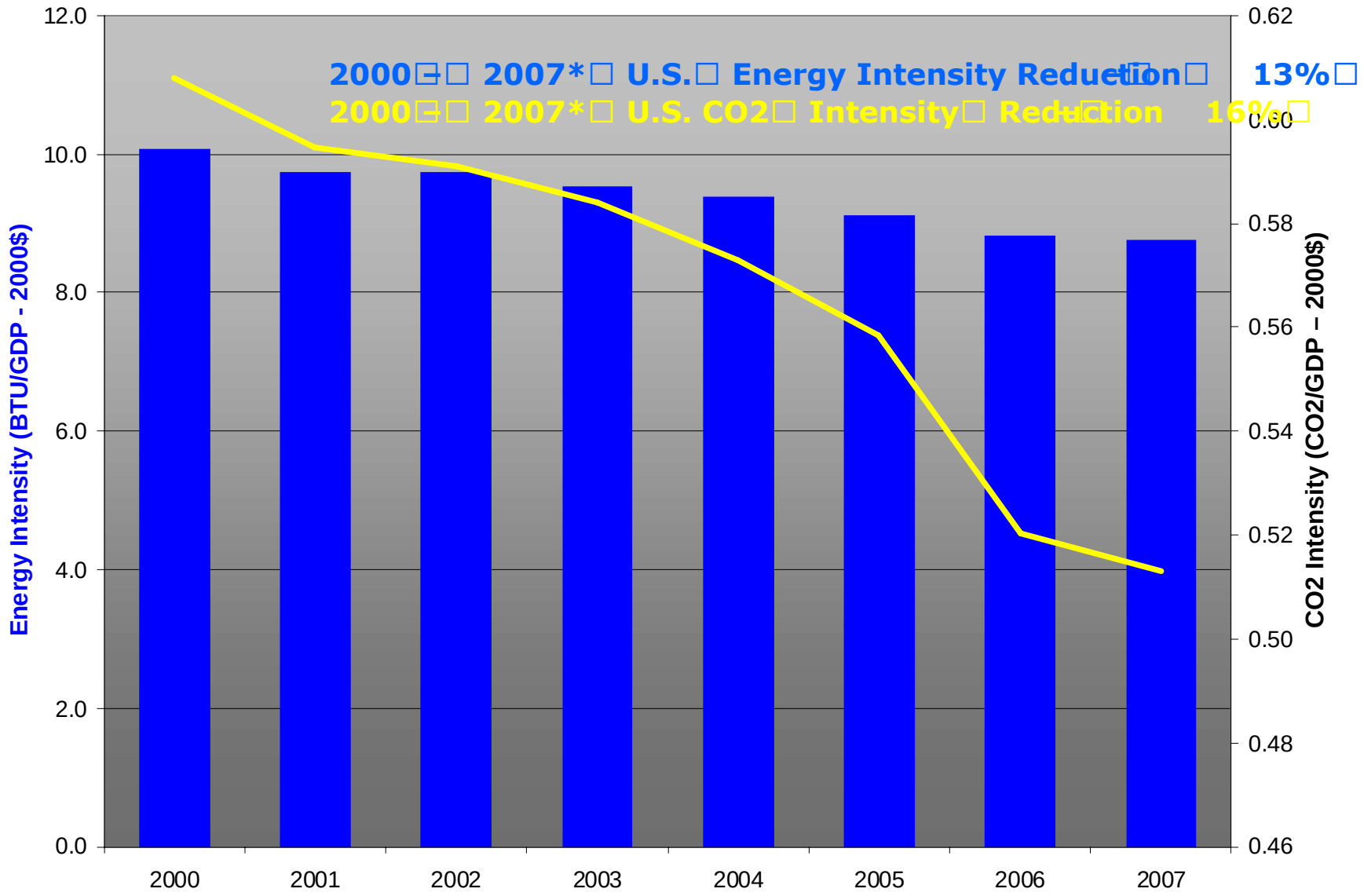
UN Climate Change Conference 2007
Bali, Indonesia
December 3 - 14

Office of Energy Efficiency and Renewable Energy

We manage America's investment in the research, development and deployment of DOE's diverse energy efficiency and renewable energy applied science portfolio.

Our mission is to develop renewable energy sources and conversion technologies, as well as efficiency best practices, regulations and technologies that collectively strengthen our economy, environment and national security.

U.S. Energy and CO2 Intensity



*All 2007 numbers are projections.

Source: EIA

Our applied science and clean energy technology portfolio is dedicated to accelerating market penetration of America's abundant, secure, affordable and clean renewable energy and energy efficiency technologies.

Power Generation

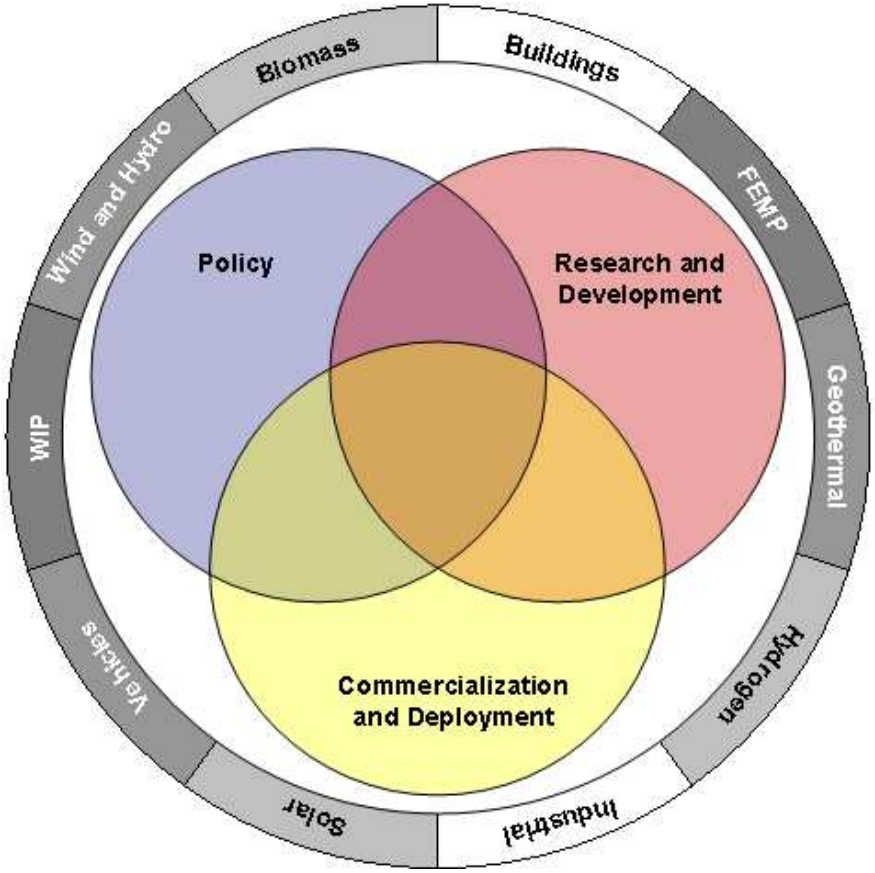
- Solar
- Wind
- Hydropower
- Geothermal

Fuels & Vehicles

- Biomass/Biofuels
- Hydrogen
- Vehicle Technologies
  - o Batteries

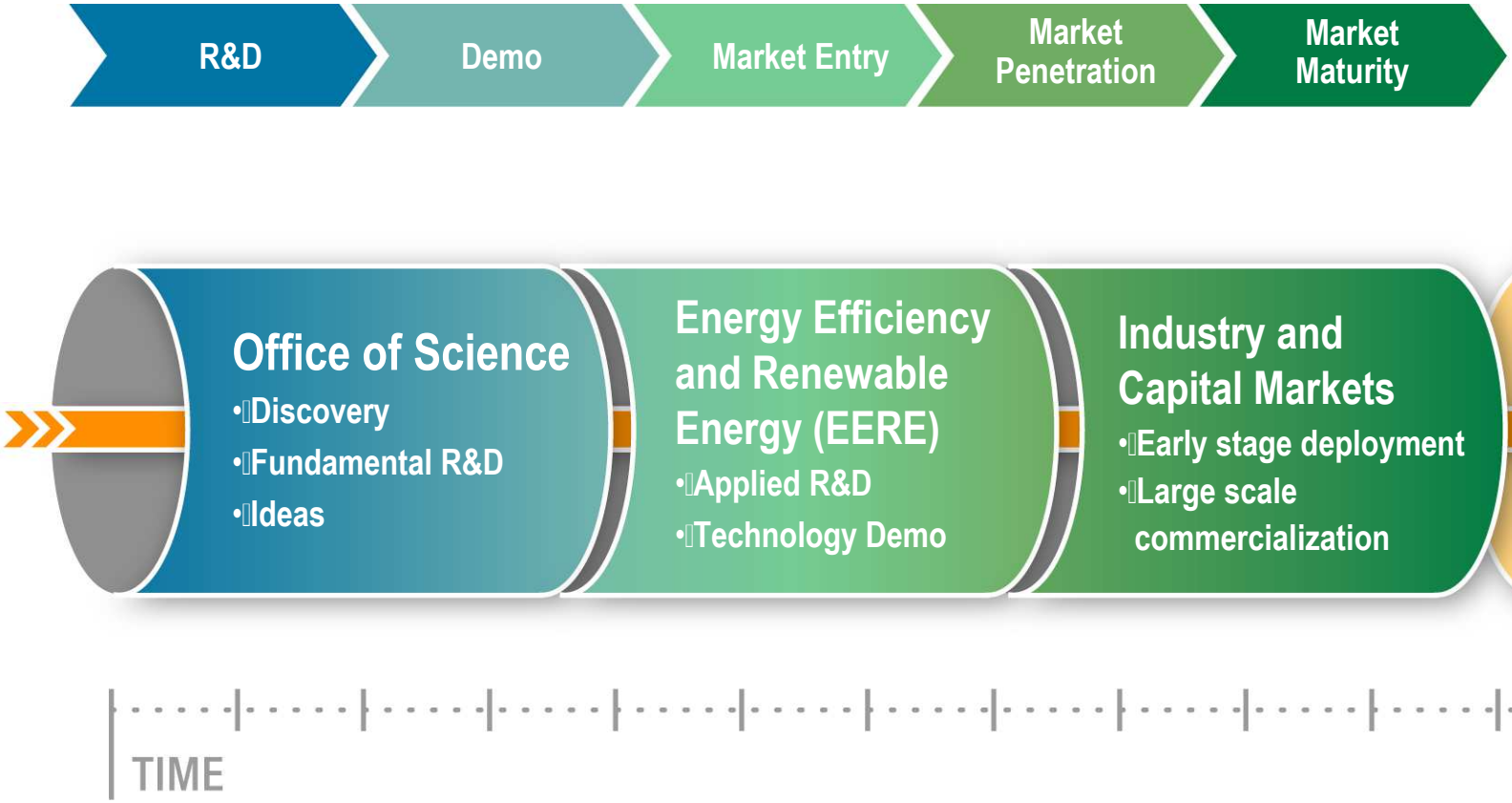
Energy Efficiency

- Buildings Technologies
- Industrial Technologies
- Weatherization
- Federal Energy Management

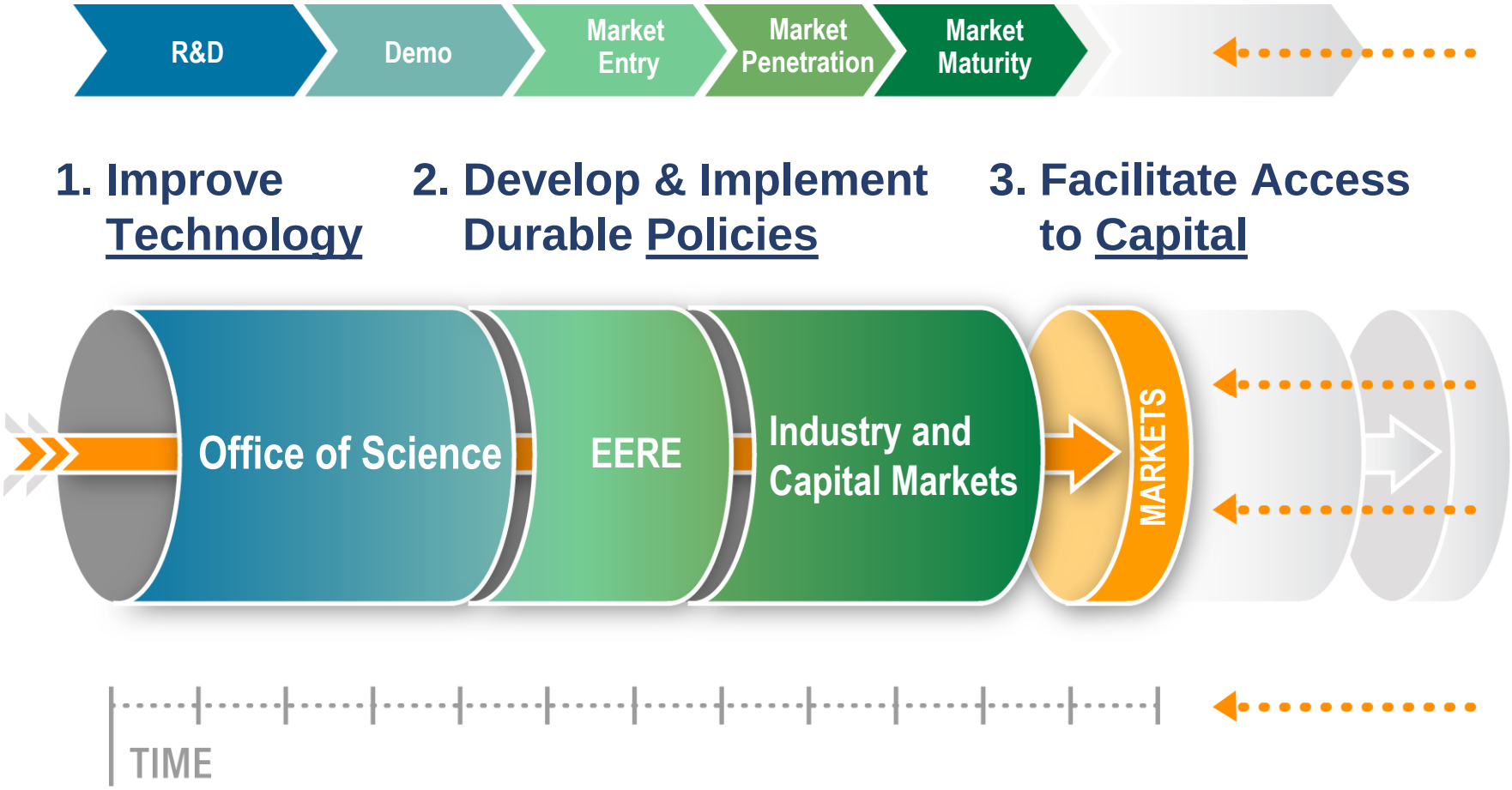


The President's Advanced Energy Initiative aims to change the way we power our homes, business, and automobiles.

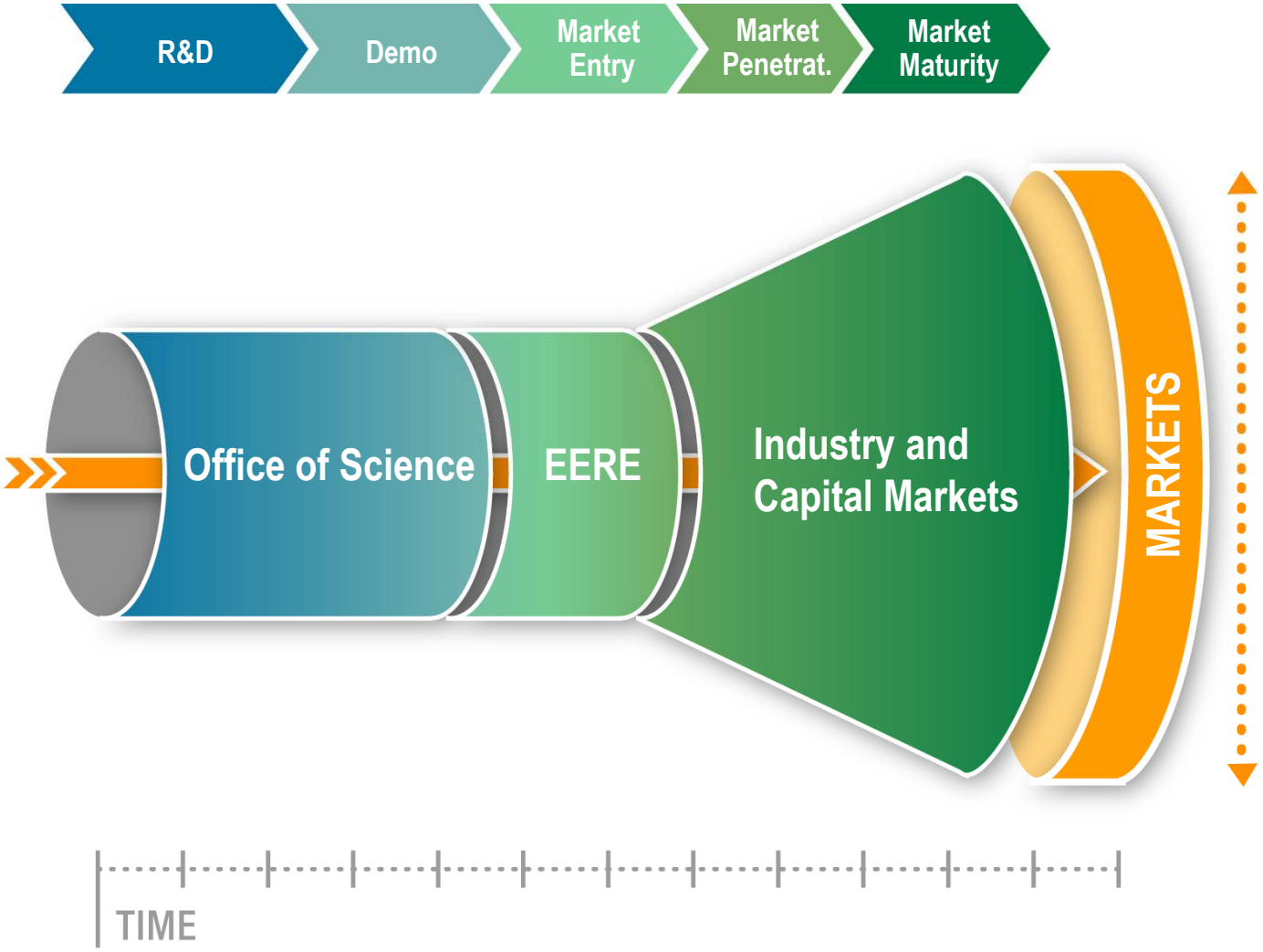
Technology Pipeline: Conventional View



Mission: Alter the Pipeline by Accelerating Technology Uptake



Accelerate and Scale Technologies



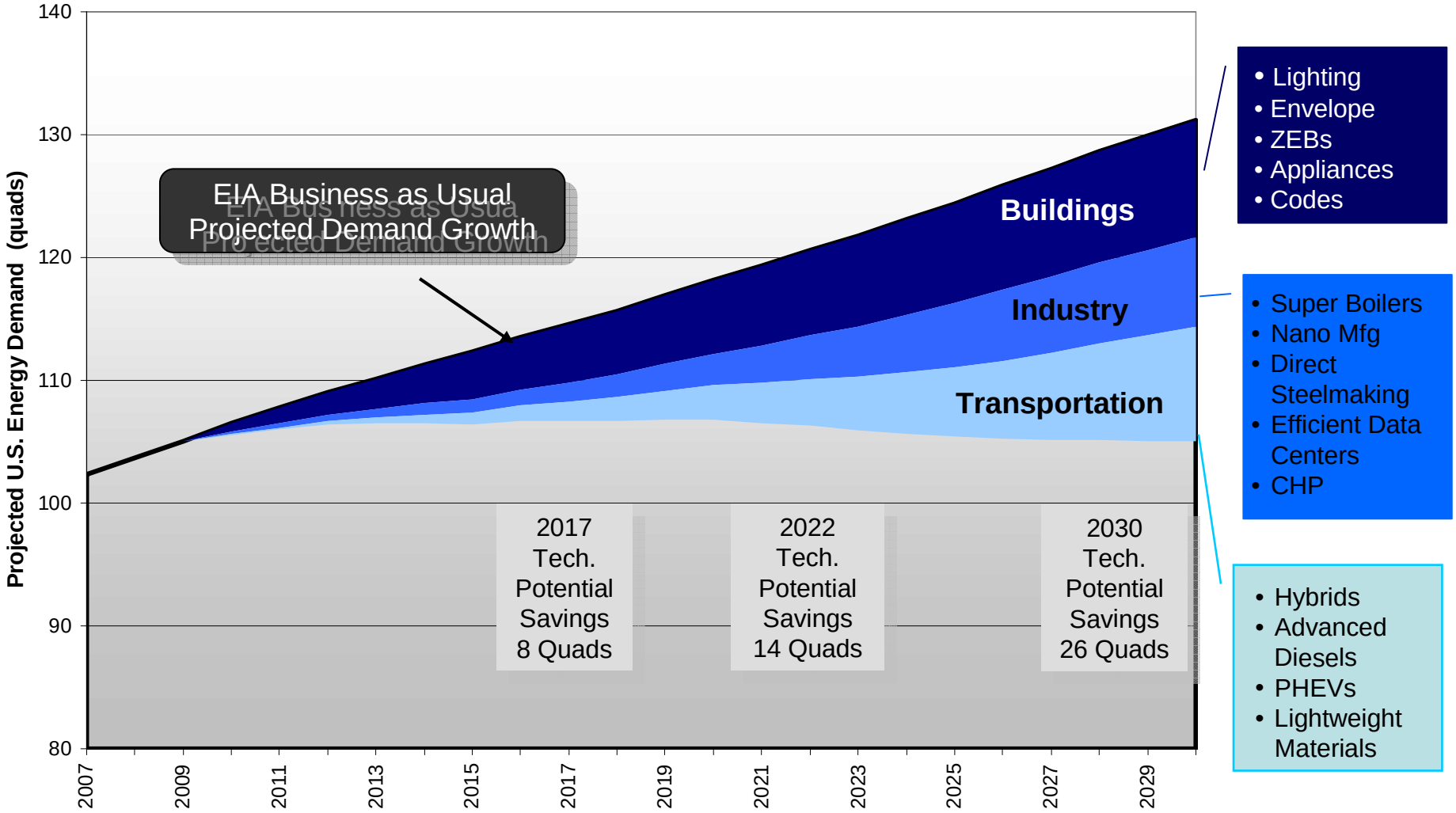
Outline

- Efficiency
- Transportation
- Gigawatt Scale Renewables
- Commercialization and Deployment
- Partnerships

Prioritization for Energy Efficiency

- **Technology**
  - Continue fundamental and applied R&D for enabling technologies to reduce the energy consumption and transform carbon footprint of the built environment (homes, offices, and manufacturing)
- **Regulation, Codes, Standards**
  - Accelerate, modernize and elevate appliance standards with greater consensus rulemakings
  - Promote superior model building codes with executable plan of coordinated implementation by the States
  - Provide utilities with returns on energy efficiency comparable or superior to investments in generation; provide industry with pathway for best practices
- **Voluntary and Market based Deployment**
  - Establishment of the National Action Plan for Energy Efficiency
  - Expand and Modernize Energy Star program concurrent w technology
  - Expand advocacy for energy efficient lighting (e.g., CFLs, LEDs)
  - Target civic infrastructure (e.g., Energy Smart schools, hospitals, libraries, municipal facilities) to be energy efficient, secure sites for distributed generation
- **Education and Outreach**
  - Multi-generational Education, targeted population, superior communications and behavioral modification

Energy Efficiency Has the Technical Potential to Level Energy Demand Growth



Source: DOE Scenario Projections

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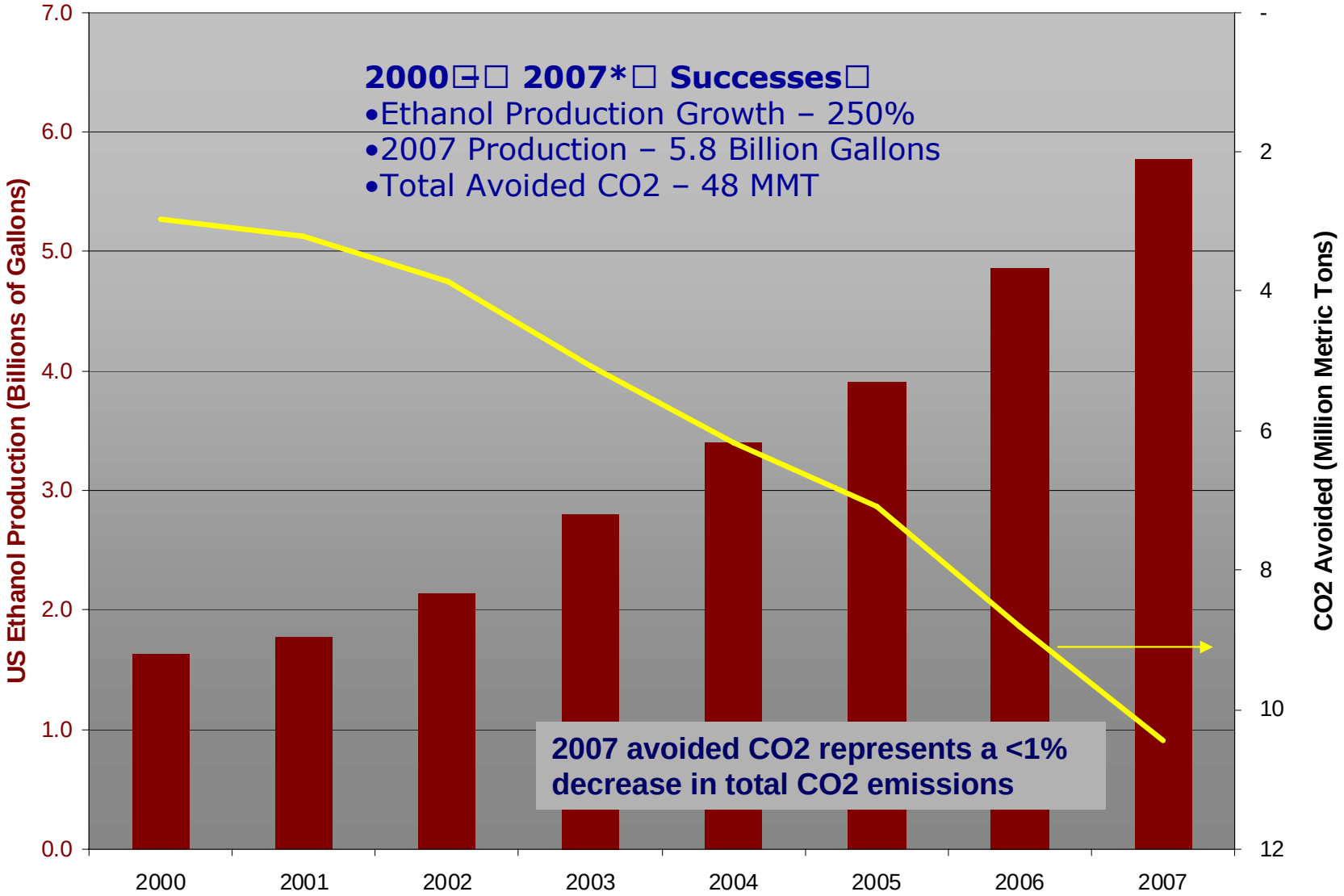
U.S. Ethanol Production and Avoided CO2

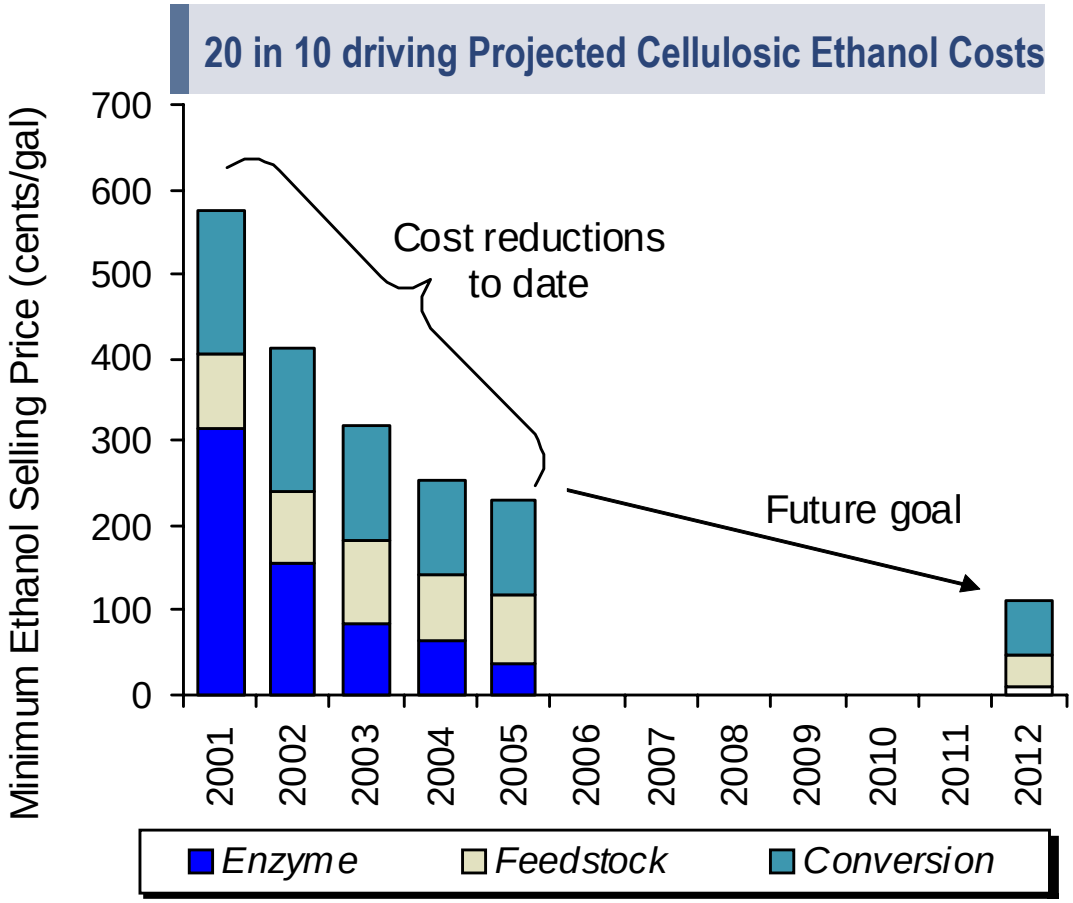


*All 2007 numbers are projections.

Sources: EIA and Renewable Fuels Assoc.

Biofuels Technical and Economic Potential

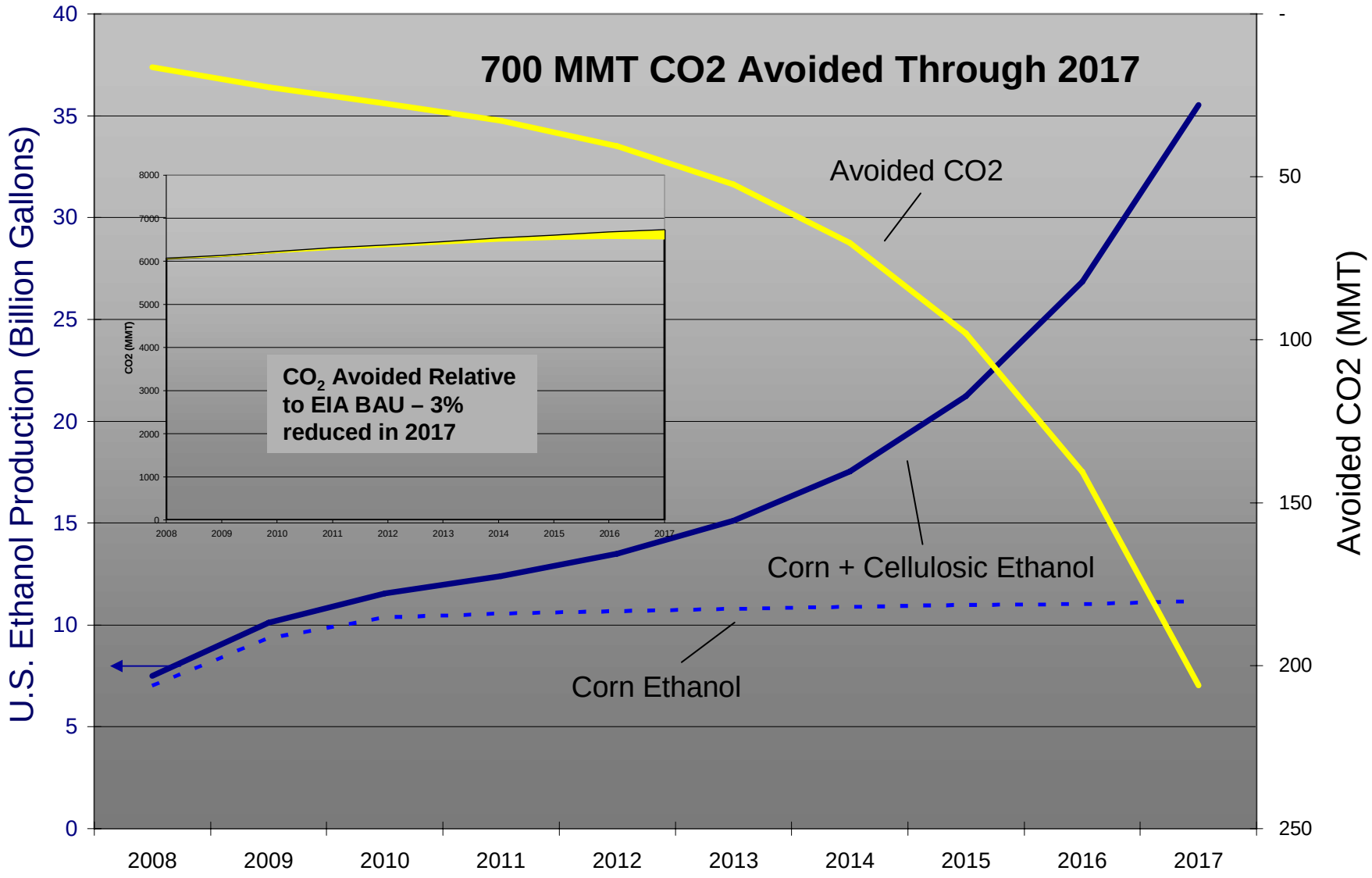
Cellulosic ethanol anticipated cost competitiveness and sustainability attributes are key to biofuels growth potential



Federal research has achieved major reductions in the cost of cellulosic ethanol

Source: Research Advances: NREL Leads the way: Celulosic Ethanol. March, 2007. Figures are for biochemical conversion

20-in-10 Ethanol Ramp and CO2 Impact



Sources: CO2 BAU – EIA; Corn Ethanol Production – EIA; Cellulosic Ethanol Production and CO2 Avoided – USDOE - EERE

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Scaling Renewable Electricity

What Scaling RE means:

- **Catalyze access to capital and markets at an unprecedented scale**
- **Integrating technologies for utility grade zero-emission power generation**

Results:

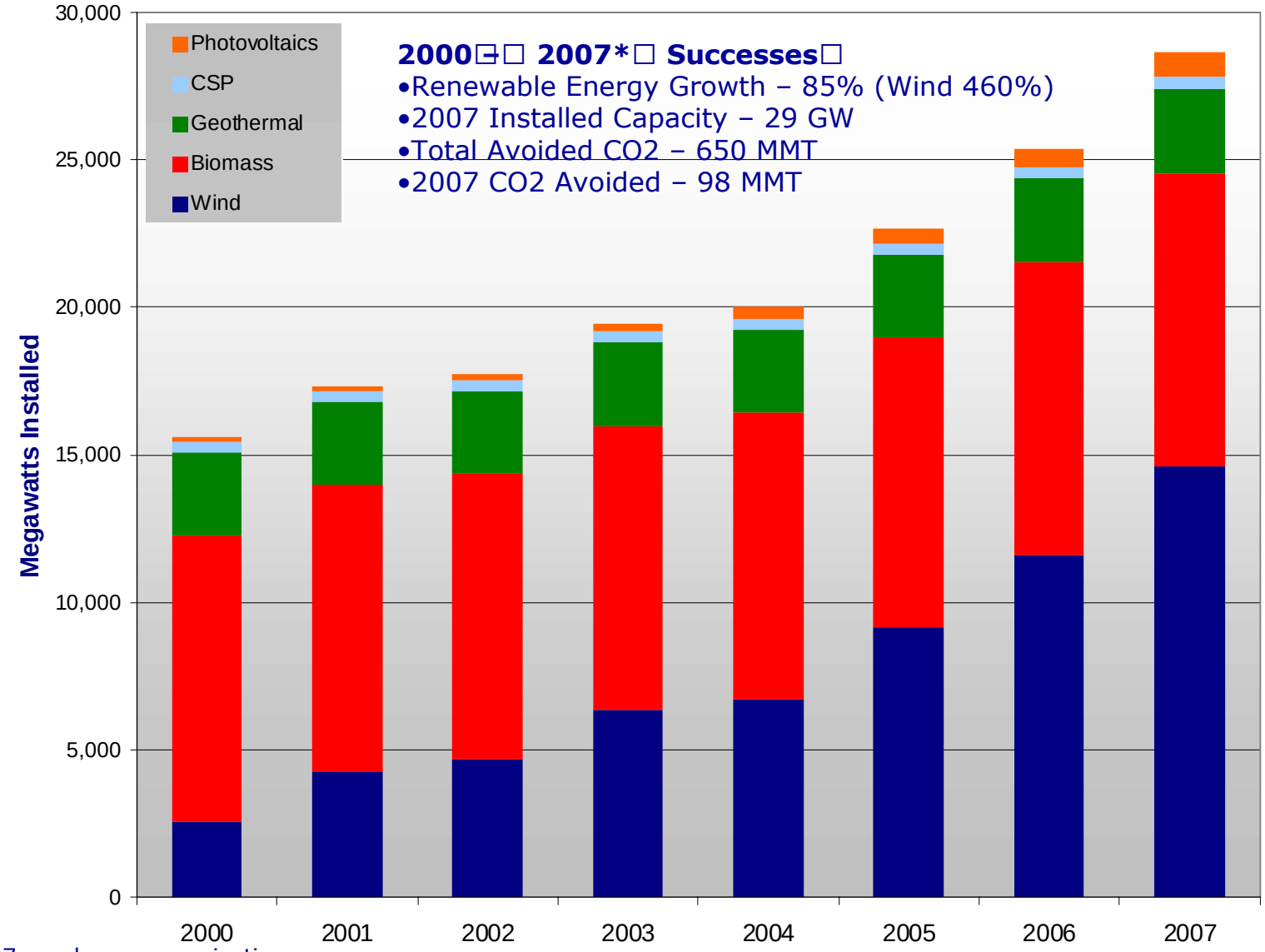
- **Substantially and continually diversify and rebalance the U.S. generation portfolio**
- **RE contributes to a larger and disproportionate percentage of new capacity additions**
- **Executing the Advanced Energy Initiative for Wind Generation at 20%**

U.S. RE Capacity Rapidly Expanding

Percent of Annual New Capacity			
	2004	2005	2006
Renewables	2%	11%	22%
Natural Gas	72%	85%	72%
Coal	2%	2%	5%
Petroleum	1%	1%	1%
Dual Fired	22%	0%	0%
Other*	0%	1%	0%

Source: EIA

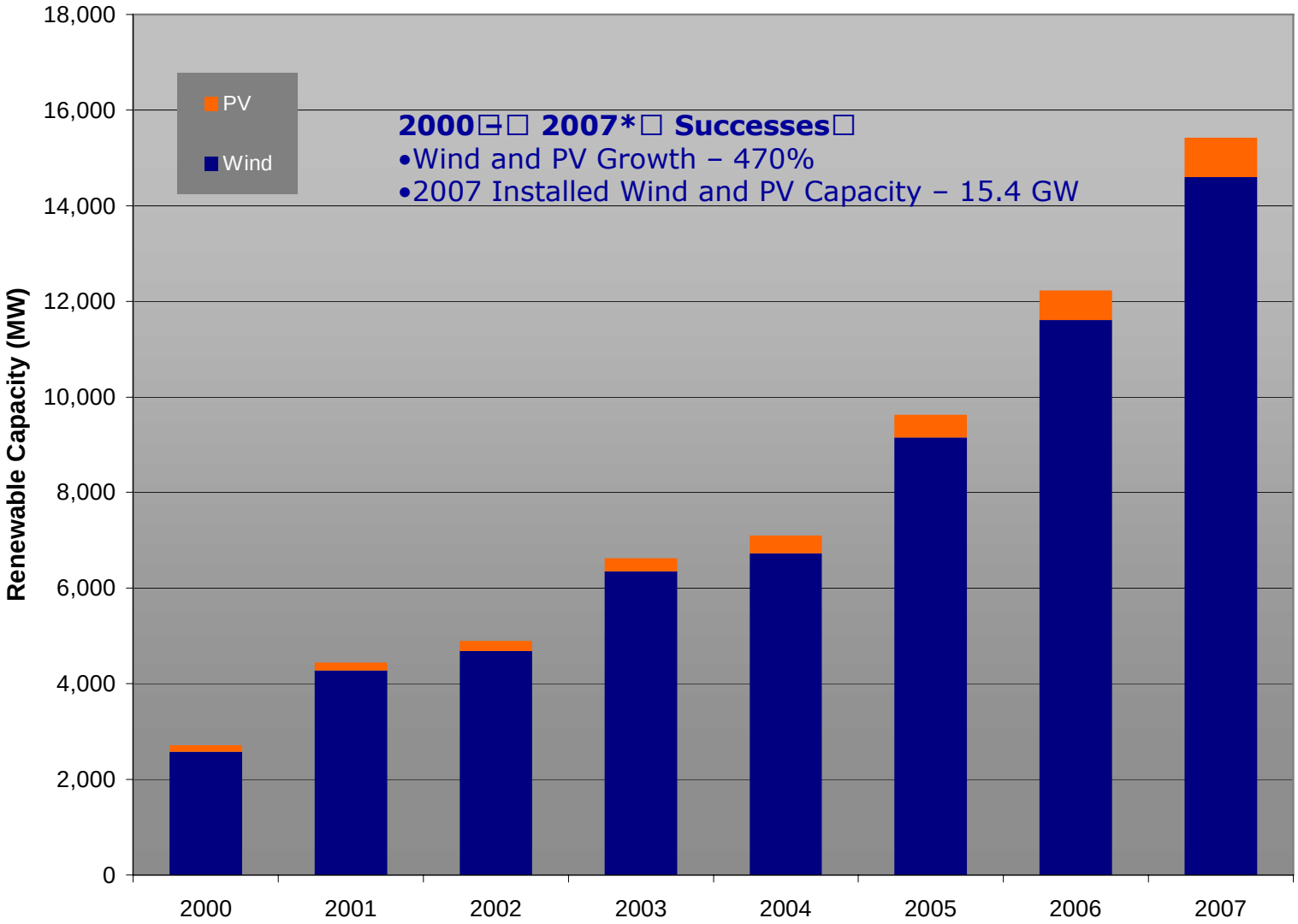
U.S. Renewable Electricity Capacity



*All 2007 numbers are projections.

Source: EIA

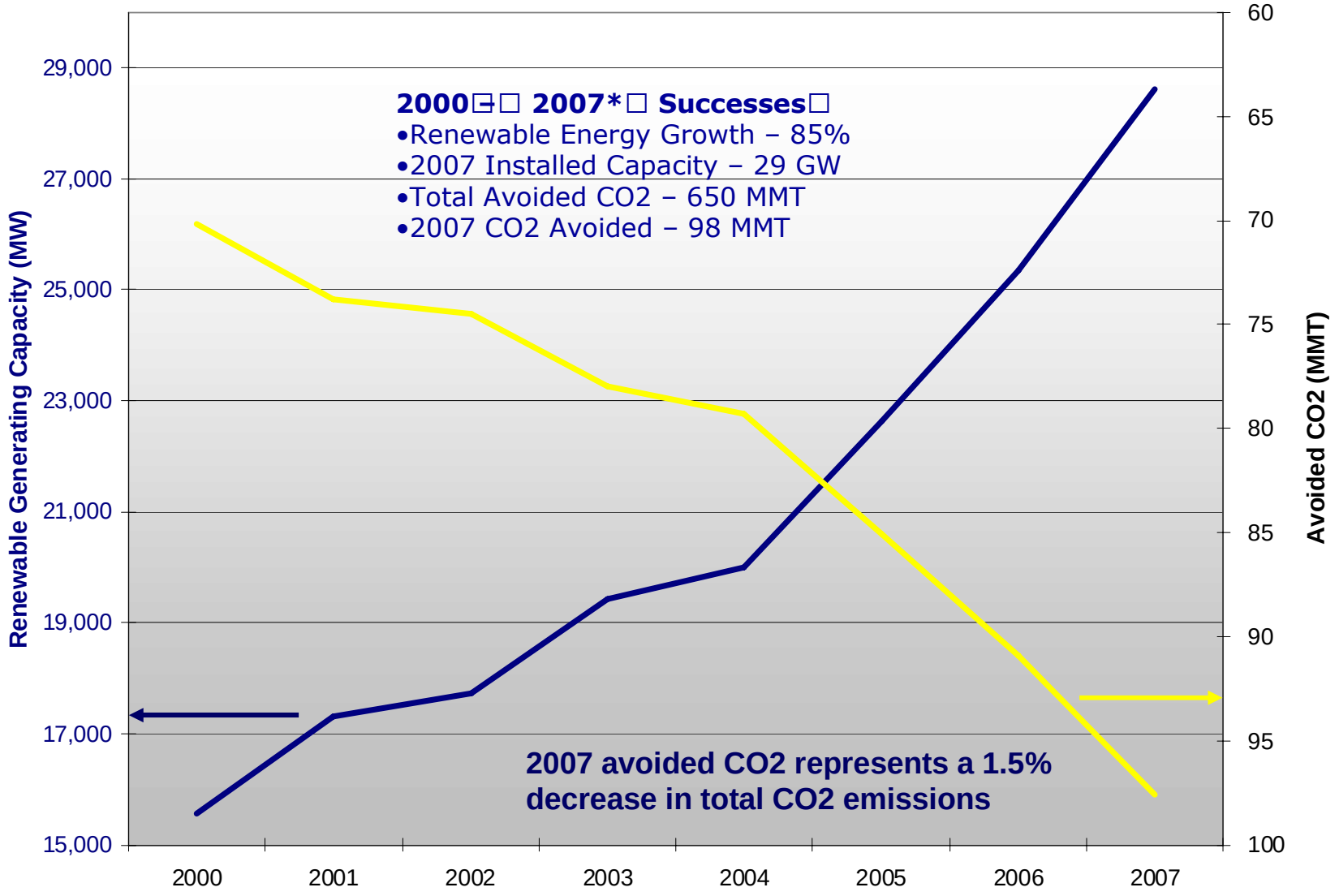
U.S. Wind and PV Capacity



*All 2007 numbers are projections.

Sources: RE capacity numbers – EIA and EERE. CO2 calculations – EERE.

U.S. Renewable Generation Capacity and Resulting CO_2 Avoided



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Sources: EIA

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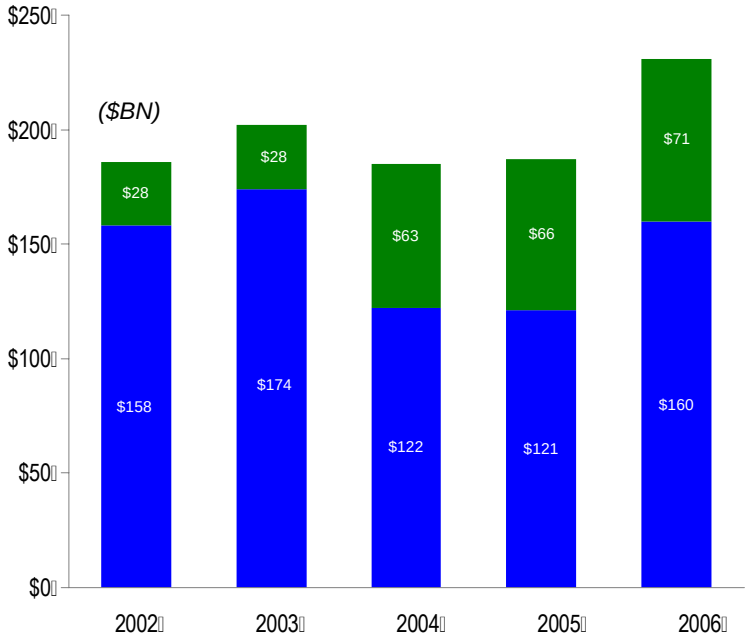
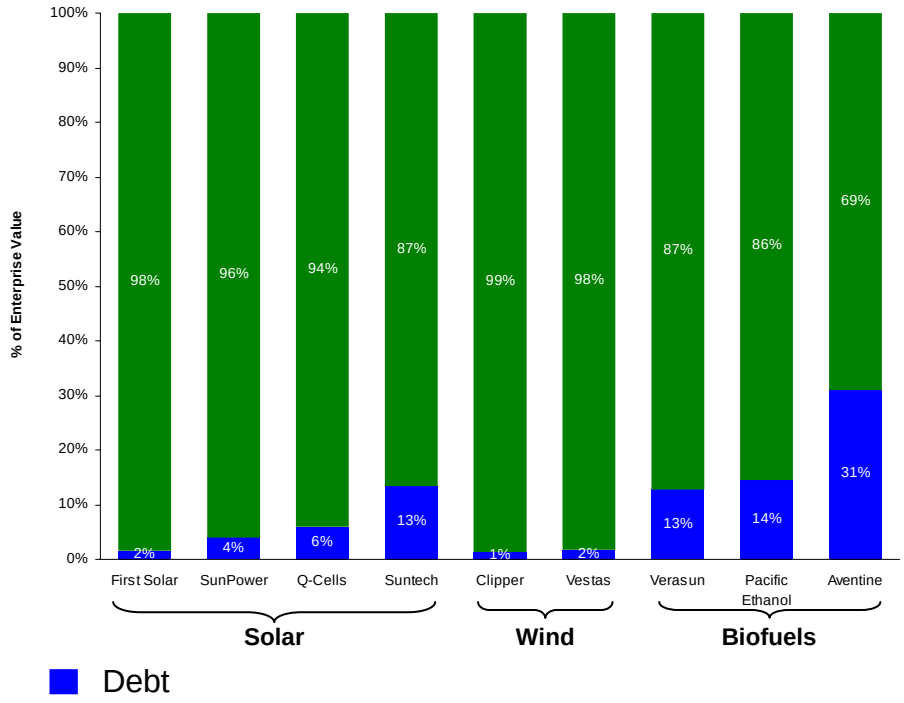
Historically utilities have used a significant amount of debt to finance large-scale infrastructure investments

Historical Global Power and Utility Capital Raises



Source: Thompson Financial.

Enterprise Value Composition of Key Renewable Energy Companies



Source: ThinkEquity Thomson Banker, First Call and Company filings as of, June 25, 2006.

A disproportionate share of the clean energy capital structure is coming from equity investments

Commercialization and Deployment

Technology Commercialization

- Technology Commercialization & Deployment Fund
- Entrepreneur in Residence program
- EERE Venture Capital Technology Showcase
- Innovation Study

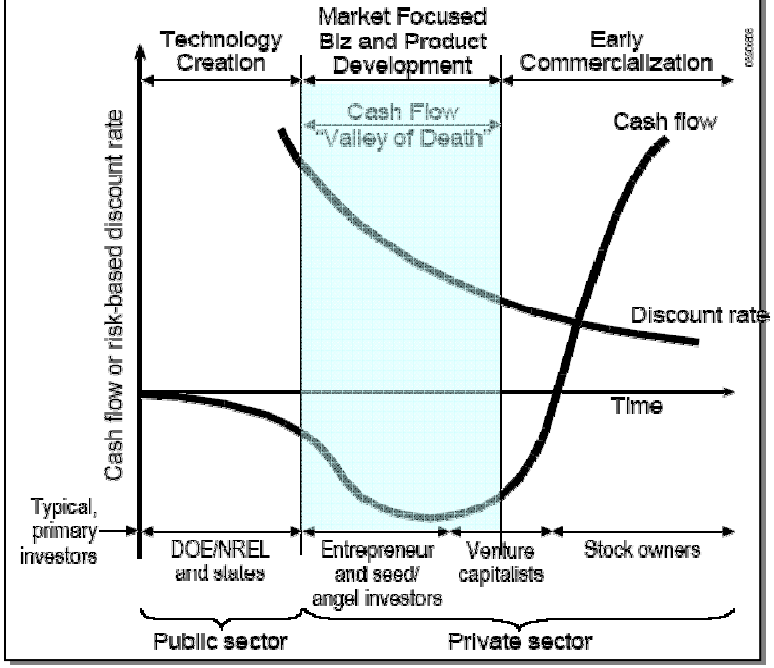
Capital Formation

- DOE Loan Guarantee Program
- Optimizing the nexus between public sector and capital markets
- Alleviating the “first-mover disadvantage” through grants, loan guarantees and streamlined permitting
- Renewable Energy Certificates (REC) Standardization

Deployment

- DOE TEAM Initiative
- Federal Energy Management Program Reform
- National Parks Deployment Partnership
- Freedom Prize

Commercialization Valley of Death

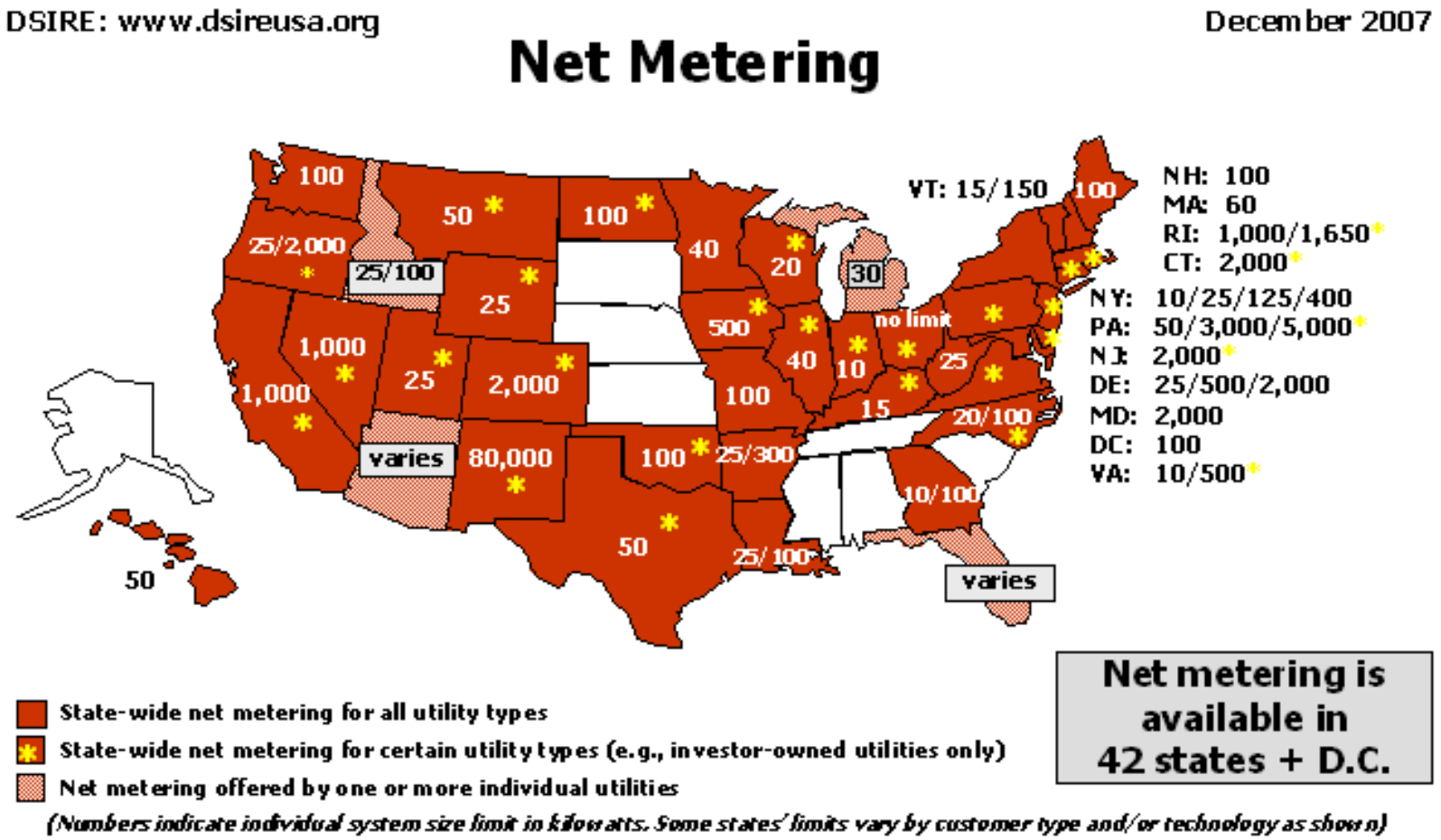


The EERE Commercialization and Deployment Team focuses on accelerating the deployment the most promising energy technologies into the commercial marketplace

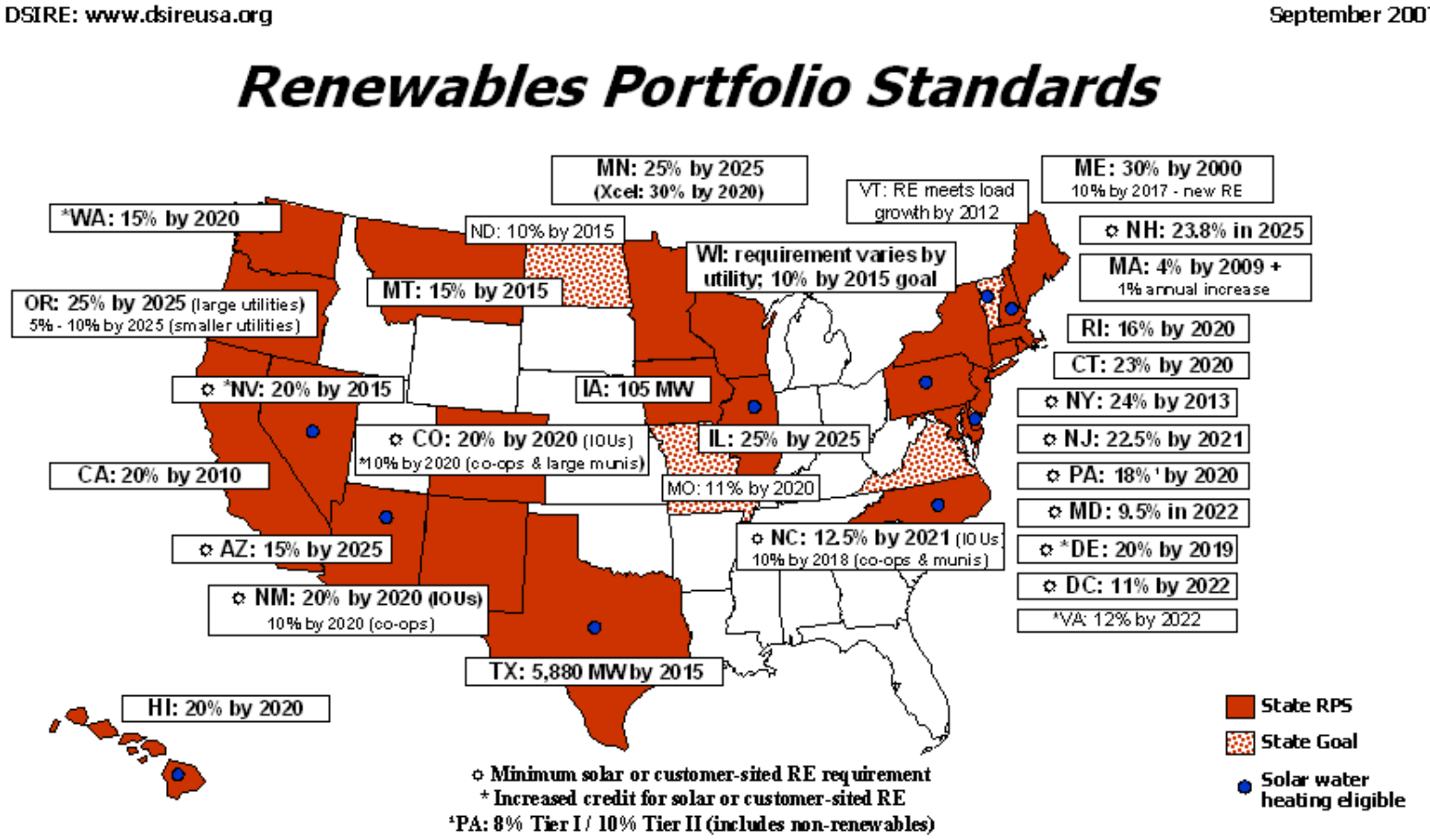
U.S. State and Local Governments Have Jurisdiction Over Many Clean Energy Policies

- The Federal Government (particularly through DOE State Energy Program) coordinates with extensive State jurisdiction over:
  - Commercial and Residential Building Codes
  - Electricity Portfolio Standards
  - Utility/Electricity Regulation, Pricing, and Interconnection
  - Transmission Siting and Permitting
  - California Exemption for Vehicle Emission Standards
  - Fuel Standards and Specifications
- State policies can create opportunities (e.g., portfolio standards, building codes, transmission, etc.)

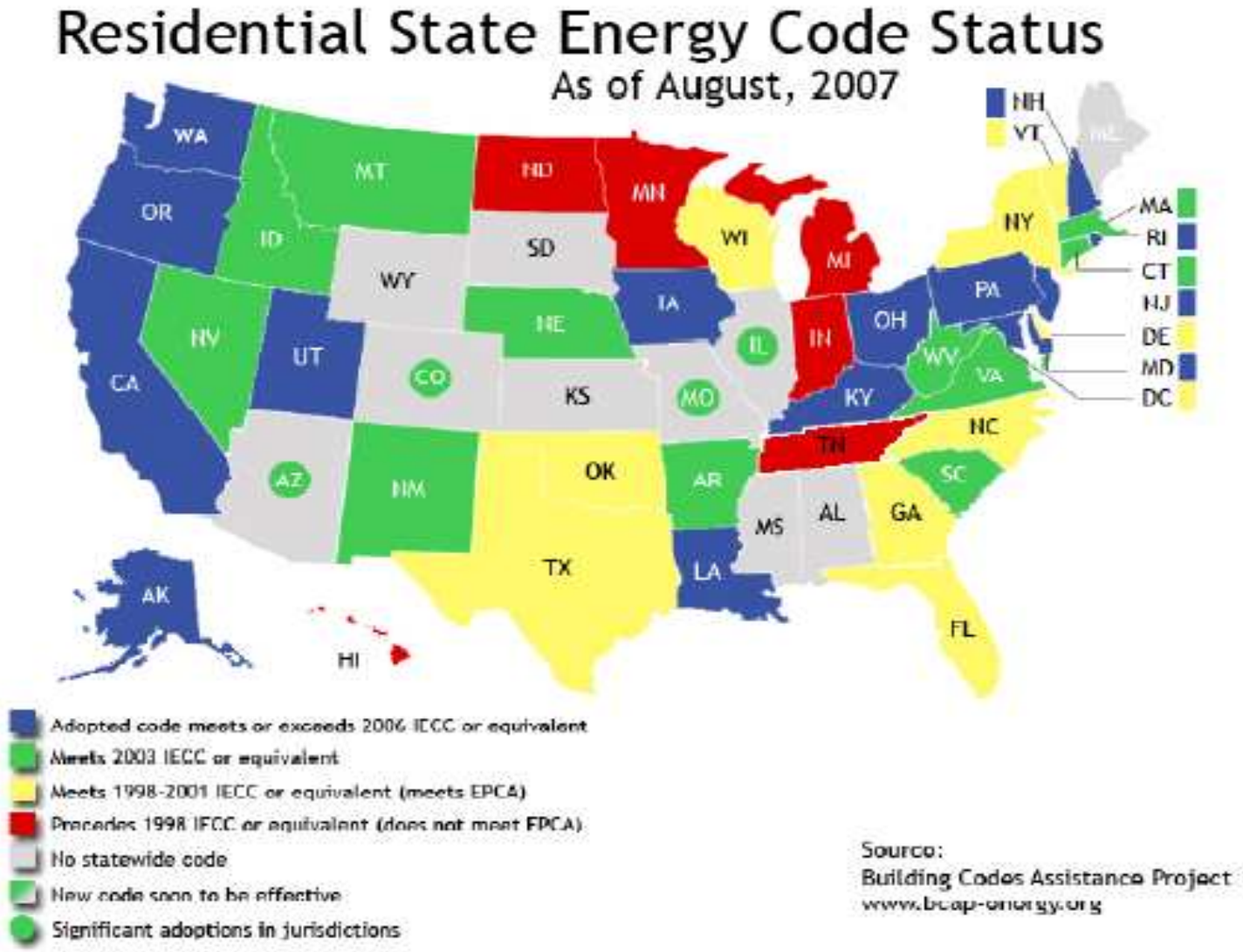
State Polices for Net Metering Allow Consumers to Sell Solar Generated Electricity Back to the Grid



State Portfolio Standards Create Opportunities for Renewable Project Development



Many States Have Outdated Building Codes



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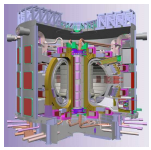
Innovative International Technology Partnerships

Carbon Sequestration Leadership Forum: **22 members; focused on CO_2 capture & storage.**

International Partnership for the Hydrogen Economy: **17 members; organizes, coordinates, and leverages hydrogen RD&D programs.**

Generation IV International Forum: **10 members; devoted to R&D on next generation of nuclear systems.**



ITER: **7 members; project to develop fusion as a commercial energy source.**

Methane to Markets: **20 members; recovery and use of methane from landfills, mines, oil & gas systems, and agriculture.**

Asia-Pacific Partnership on Clean Development & Climate: **7 members; focuses on accelerating deployment of technologies to address energy security, air pollution, and climate change.**

Global Nuclear Energy Partnership: **19 members; seeks consensus on enabling expanded use of nuclear energy using a nuclear fuel cycle that enhances energy security, while promoting non-proliferation.**

U.S. DOE Country Collaborations

U.S. Energy Department International Collaborations				
China	**India**	**Japan**	**Brazil**	**EU**
General EE Industrial EE Buildings Vehicles Biomass Geothermal Wind Solar Hydrogen Nuclear Fusion Energy FutureGEN CO2 Seques.	General EE Industrial EE Buildings Vehicles Biomass Solar Hydrogen Nuclear Fusion Energy FutureGen CO2 Sequestration	General EE Industrial EE Buildings EnergyStar Vehicles Geothermal Wind Solar Hydrogen Nuclear Fusion Energy FutureGEN CO2 Sequestration	General EE EnergyStar Biomass Hydrogen Nuclear CO2 Sequestration	Industrial EE Buildings EnergyStar Solar Hydrogen Nuclear Fusion Energy CO2 Seques.

All Science Is Global…
America is dedicate to collaborating and relentlessly advancing clean energy research and development

Please contact us at

www.eere.doe.gov

for opportunities to work together on clean energy and CO2 reductions